LANL actinide nuclear data measurements

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Cross Section Evaluation Working Group meeting

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Collaborators

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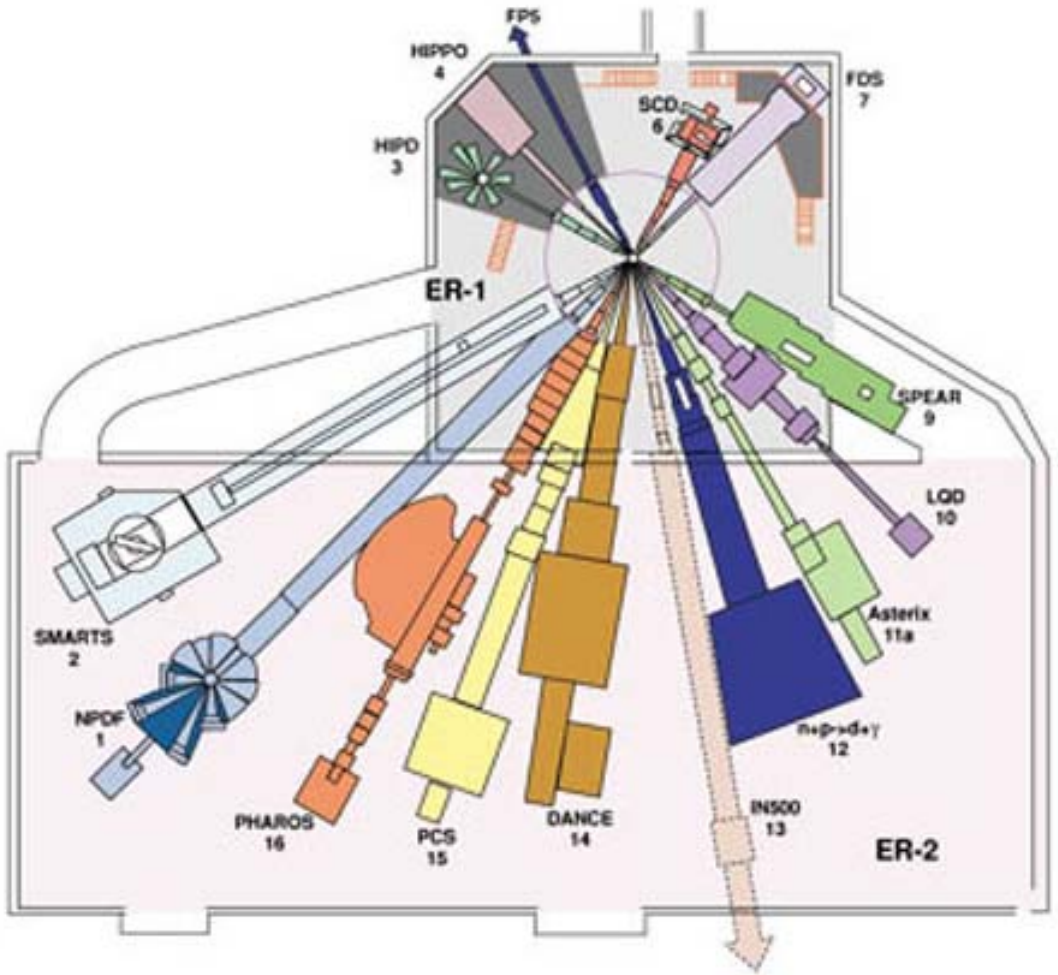
Outline

- (n,γ) - DANCE
- (n, γ)/(n,f) - DANCE
- (n,f)
- Outlook

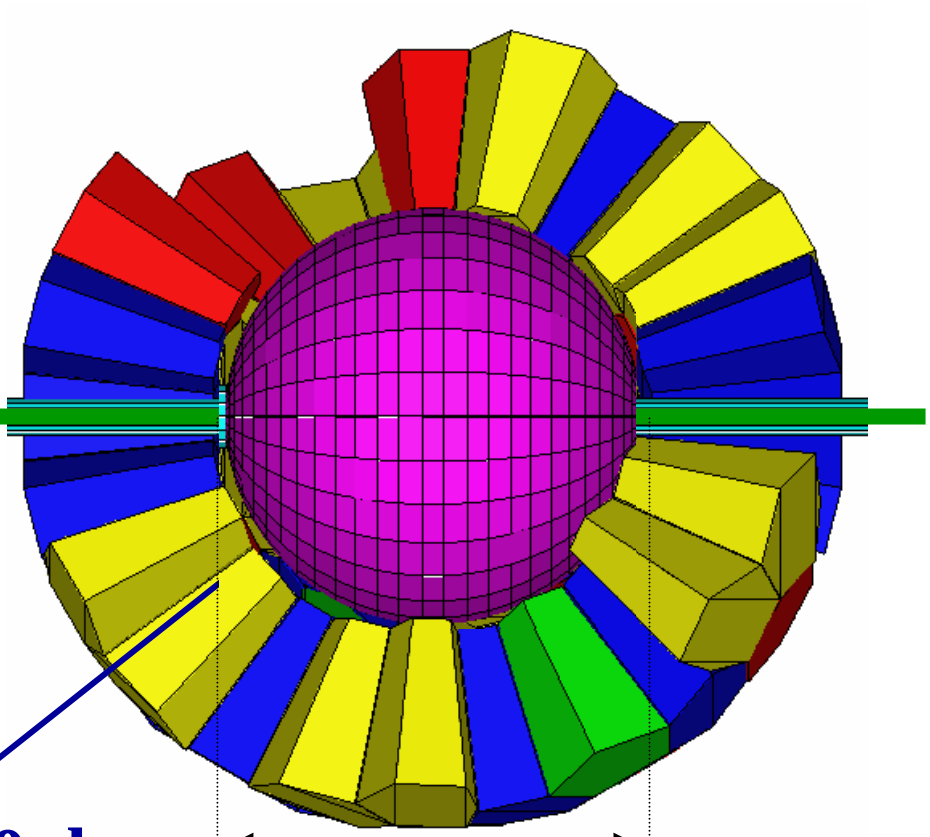
LANSCE @ LANL

Manuel Lujan Jr. Center



FP 14 views the second-tier coupled water moderator.

*D*etector for *A*dvanced *N*eutron *C*apture *E*xperiments



collimated neutrons beam

sample

$t_{1/2}$ > 100 d

m ~ 1 mg

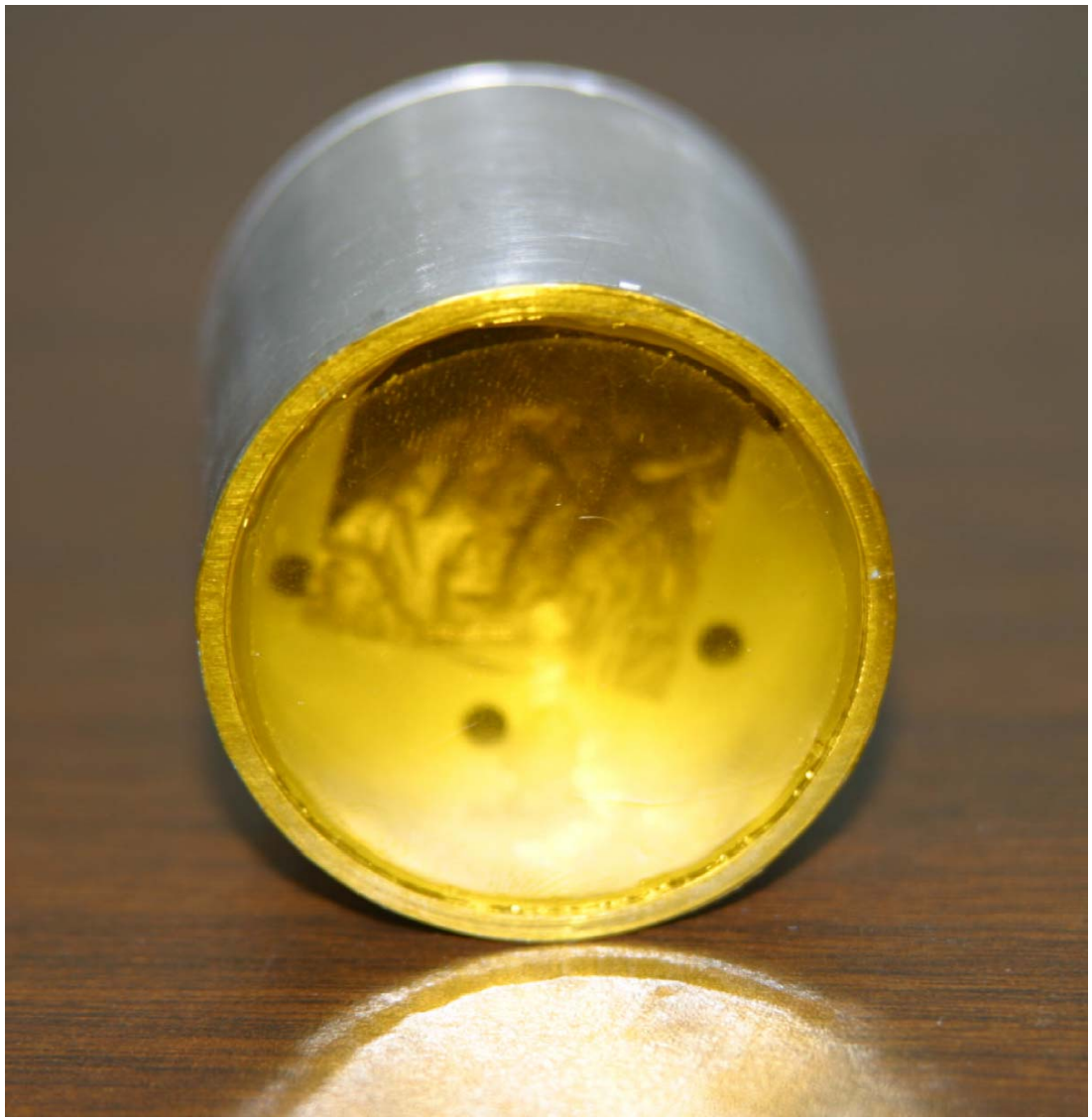
neutrons:

- **spallation source**
- **thermal .. 500 keV**
- **20 m flight path**
- **3 10^5 n/s/cm^2/decade**

γ-Detector:

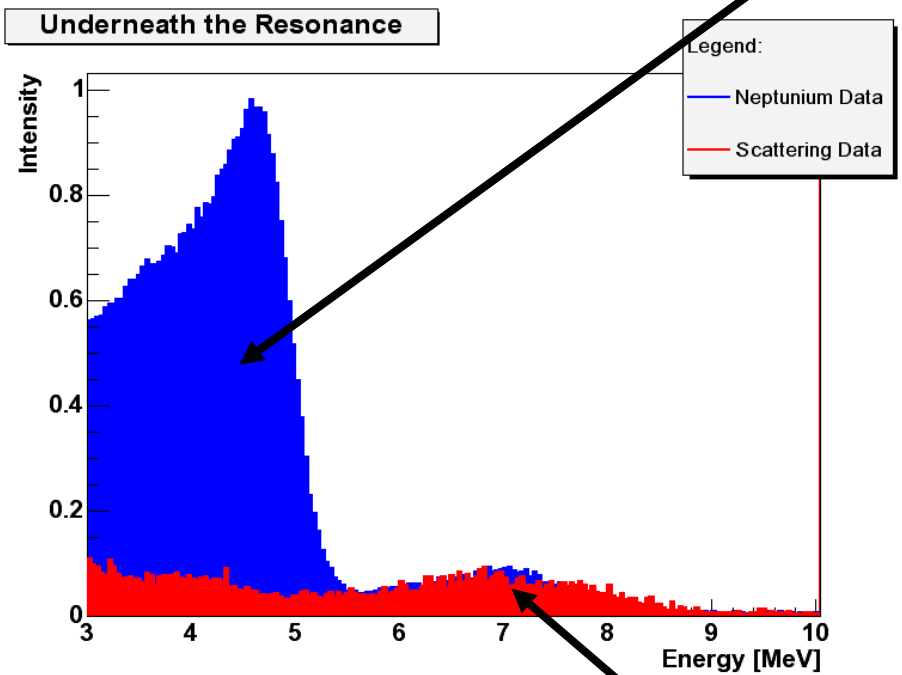
- **159 BaF_2 crystals**
- **4 different shapes**
- **R_i=17 cm, R_a=32 cm**
- **7 cm ^{6}LiH inside**
- **$\varepsilon_\gamma \approx$ 90 %**
- **$\varepsilon_{casc} \approx$ 98 %**

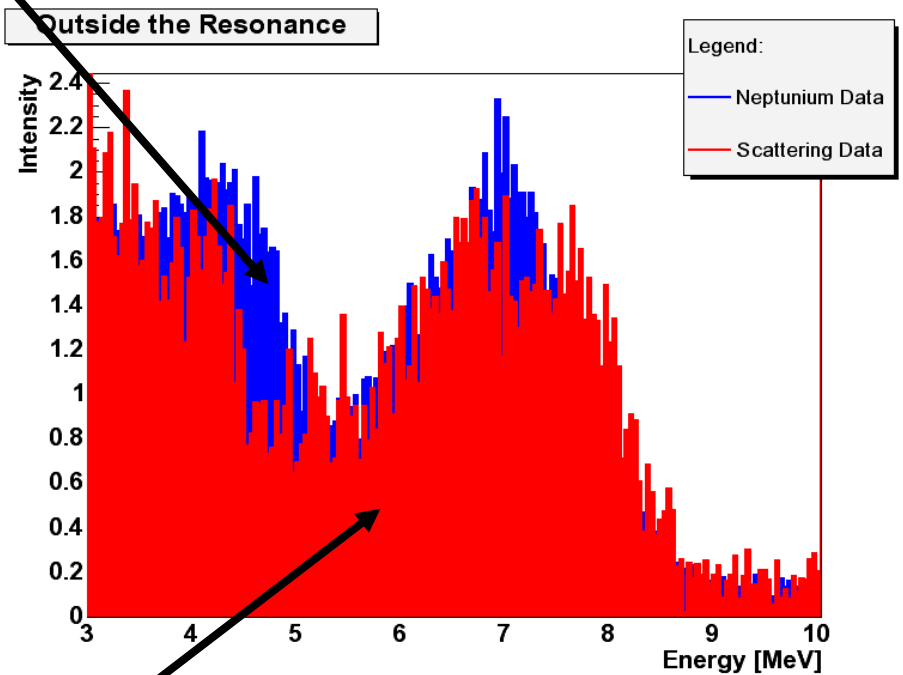
Radioactive Target Holder (RTH)



0.4 mg of ^{237}Np

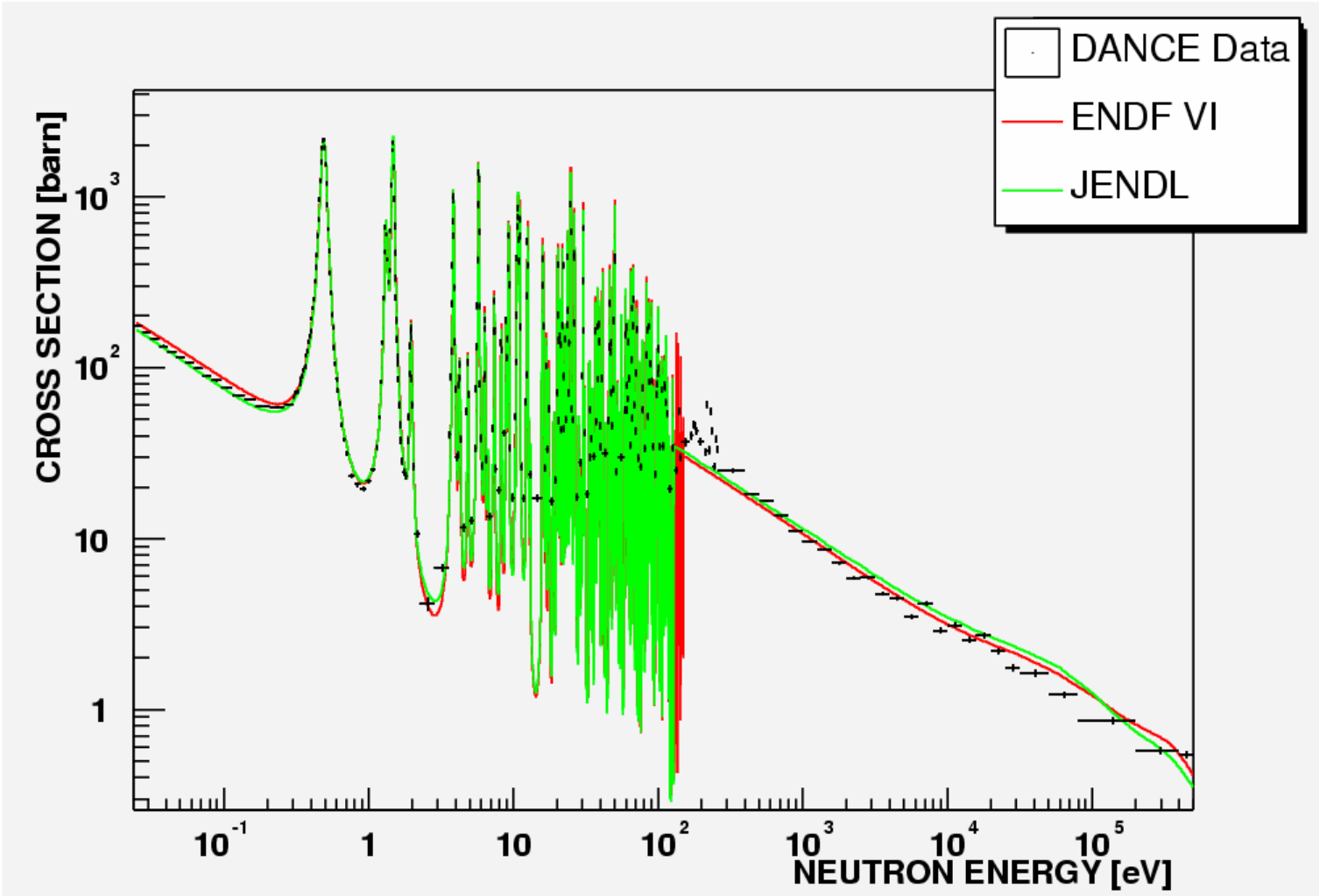
^{237}N(n,γ) signal



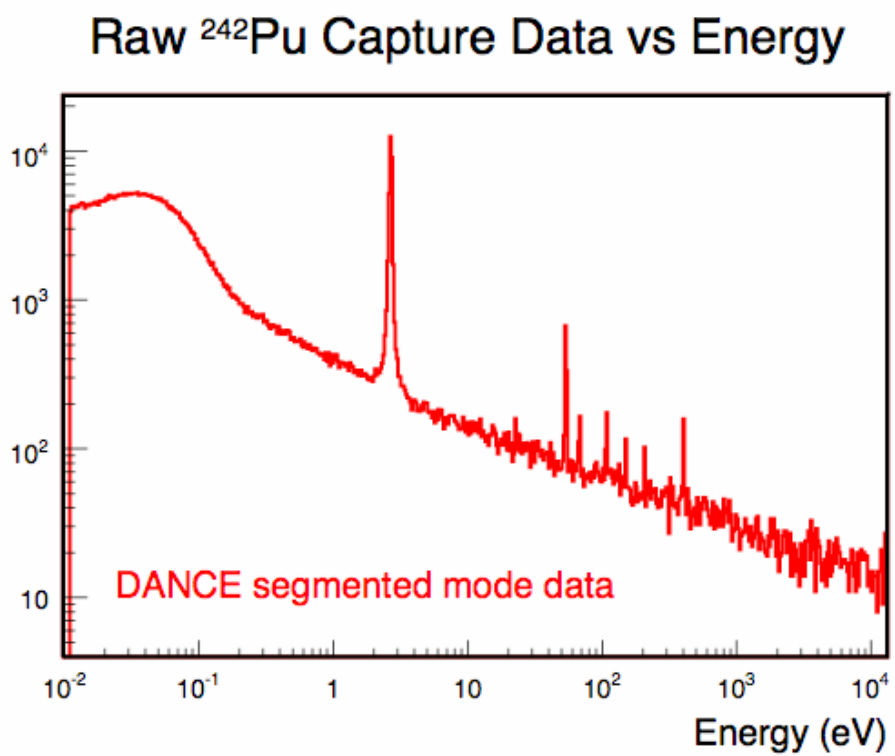


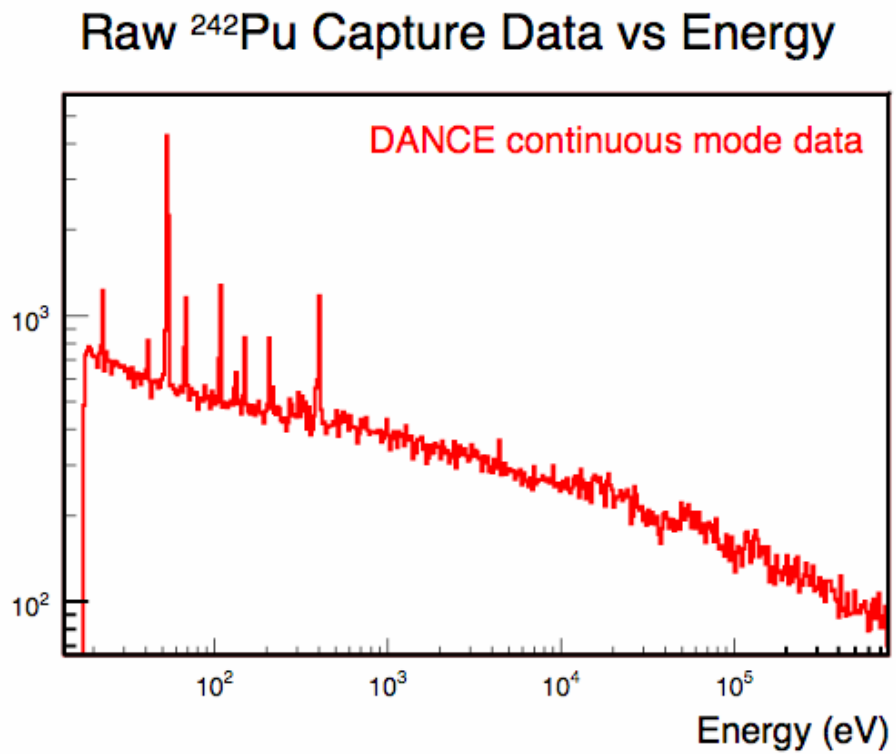
(n,n) background

^{237}Np Status: Final results, statistical uncertainties



0.7 mg of ^{242}Pu





(n,g) overview

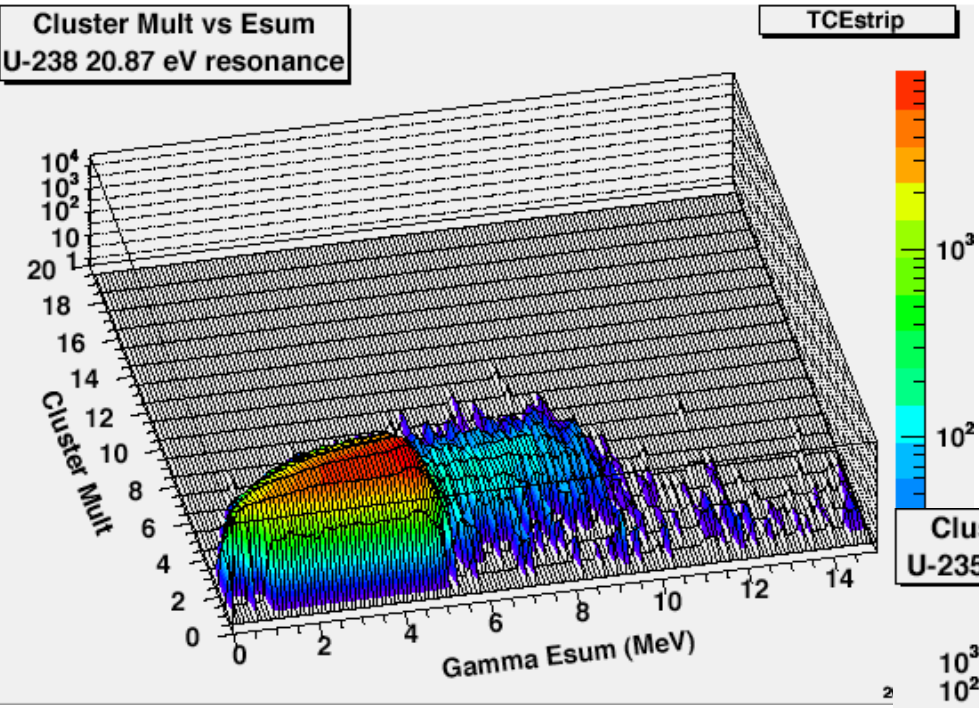
^{237}Np - completed

$^{234, 235, 236, 238}$U – analysis in progress

^{242}Pu – experiment performed

^{240}Pu – experiment scheduled for FY06

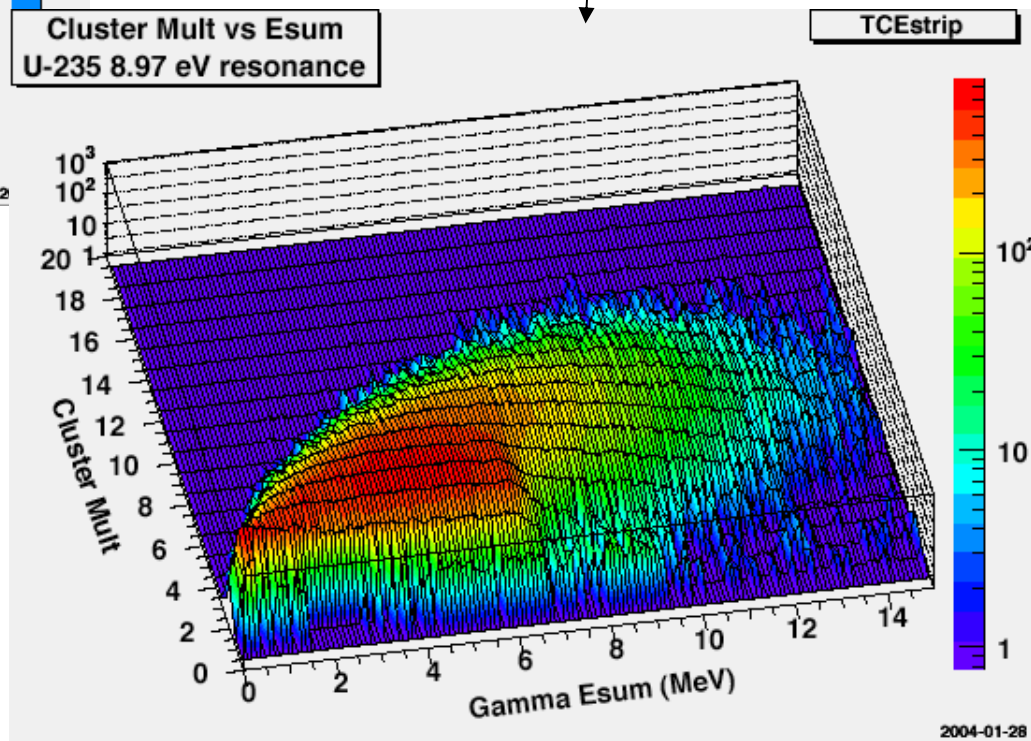
(n,g)/(n,f) ratio



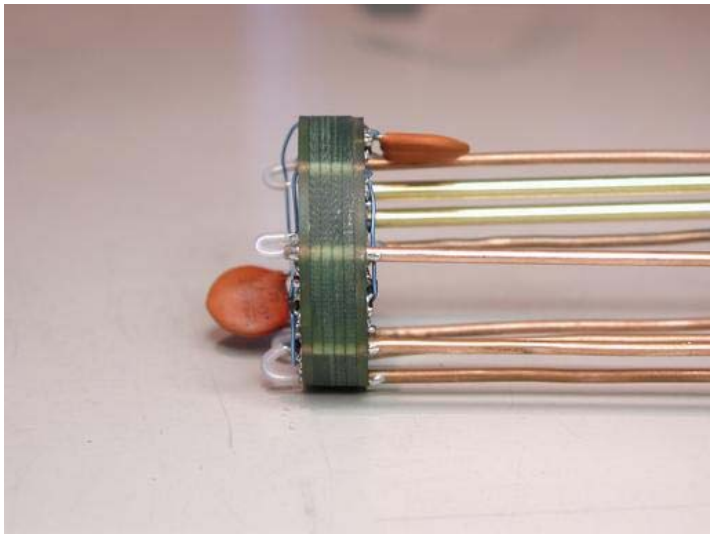
^{238}U

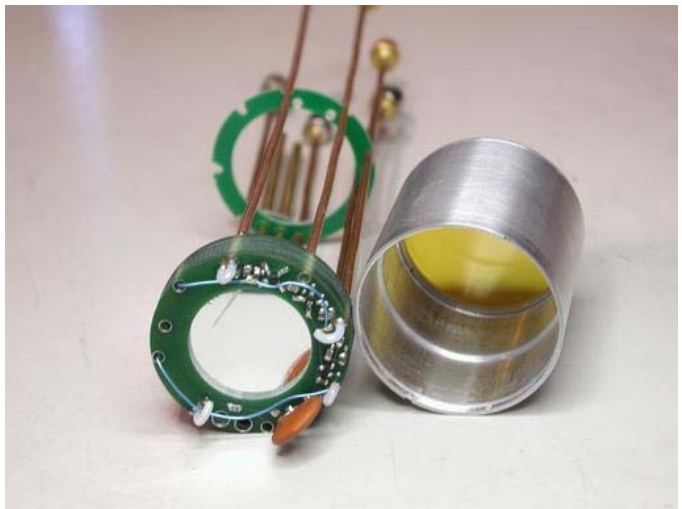
(n,γ)

$(n,\gamma) + (n,f)$



(n,g)/(n,f) ratio using fission trigger

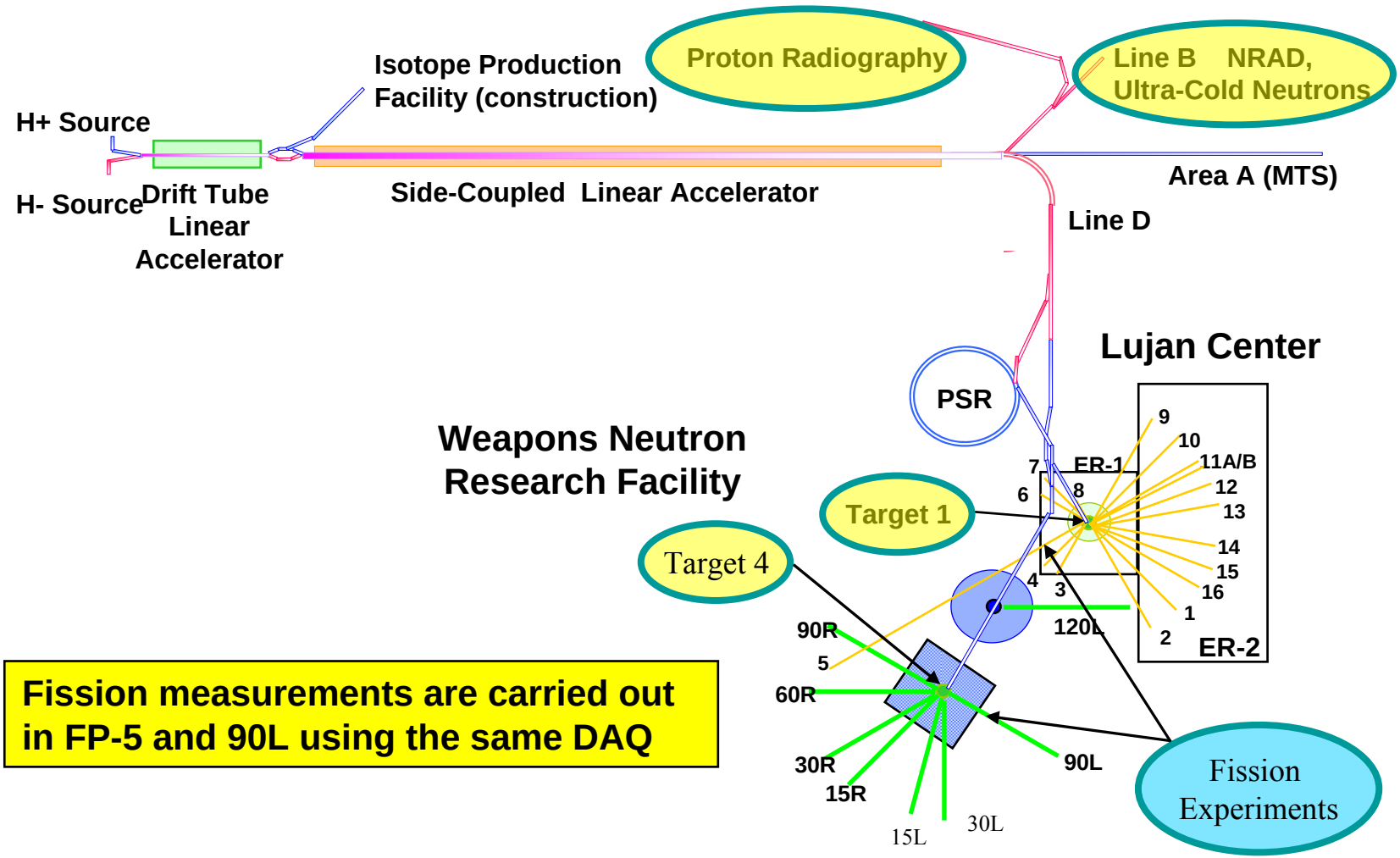




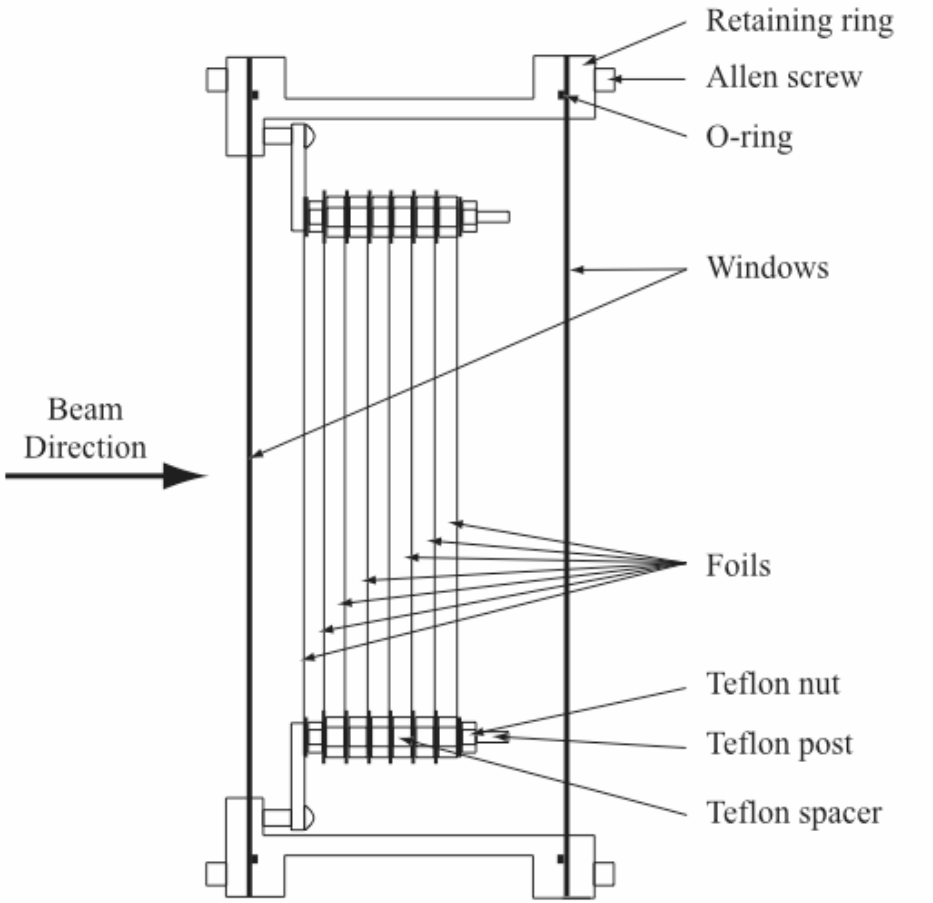
Status of (n,g)/(n,f)

- Successful proof of principle for ^{235}U
- Runs on $^{241,242,243}Am$ planned for this calendar year

Fission Measurements at WNR and Lujan Center



Detection:Fission chamber



Targets loaded

U^{235}, U^{238}, Np^{237}, blank

Chamber operation

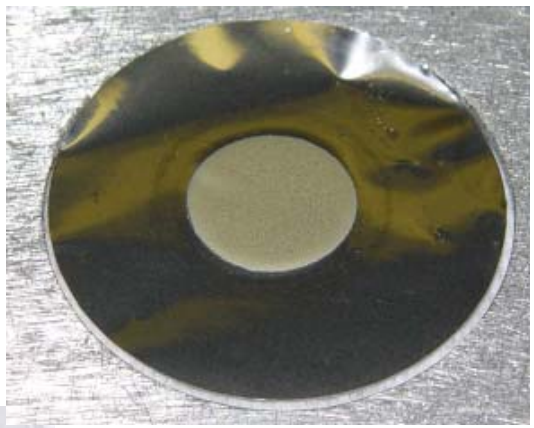
P-10 Pressure : 12psi

Drift Voltage : -300V

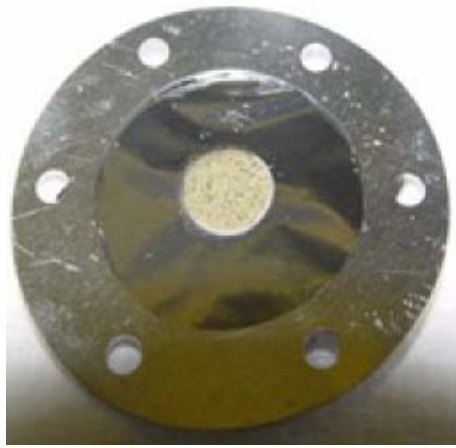
Target Preparation at Idaho National Laboratory

^{239}Pu

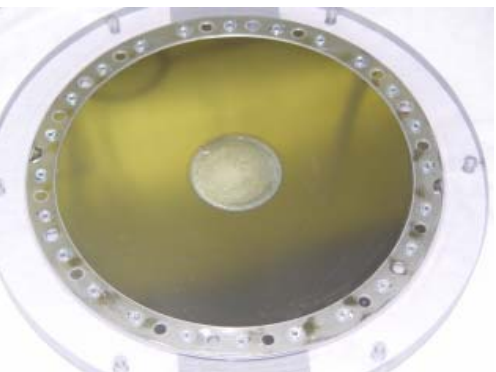
capture



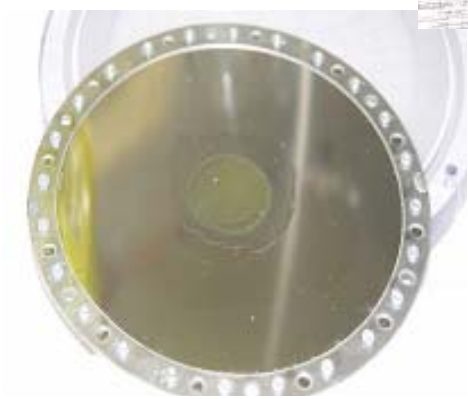
^{242}Pu



^{239}Pu

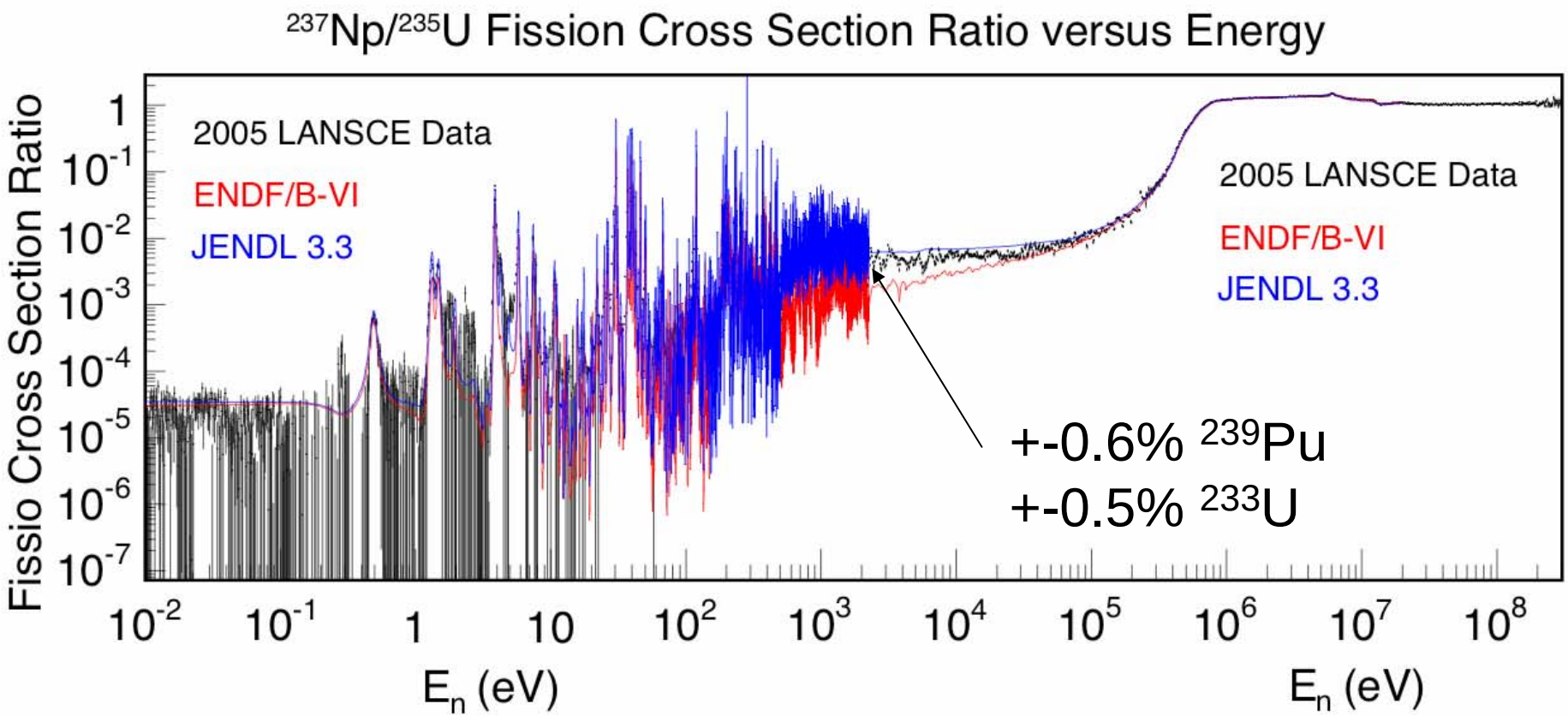


^{242}Pu



fission

Systematic uncertainties due to contaminant levels is limited to 0.6% in the fast region and above



^{239}Pu and ^{233}U data collected for background subtraction
To complete the ^{237}Np/^{235}U fission ratio measurement

Fission measurements summary

Completed in FY`05

- $^{237}Np/^{235}U$ fission ratio complete
- Preliminary ^{242}Pu fission data taken
- Paperwork in place for ^{240}Pu
- Beam time proposal for ^{240}Pu well received and scheduled

Planned for FY`06

- Continue upgrades to Lujan and WNR flight paths
- Measure $^{242}Pu/^{235}U$ fission ratio
- Preliminary ^{240}Pu fission data